Lesson 19: Four Interesting Transformations of Functions

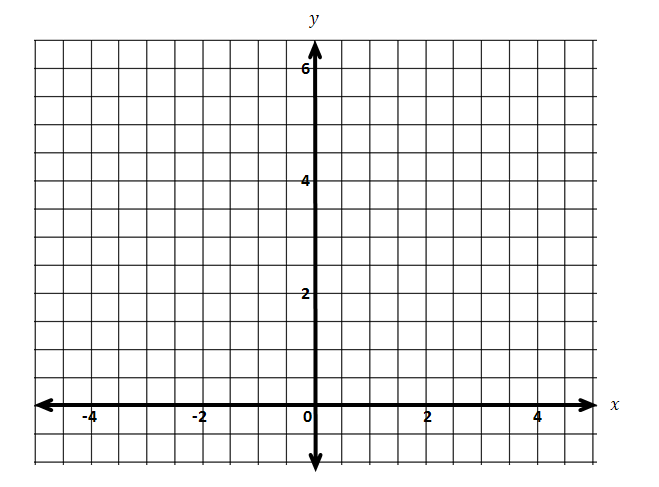
Classwork

**Example 1**

Let and , where can be any real number.

1. Write the formula for in terms of (i.e., without using notation):
2. Complete the table of values for these functions.

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1. Graph both equations: and .

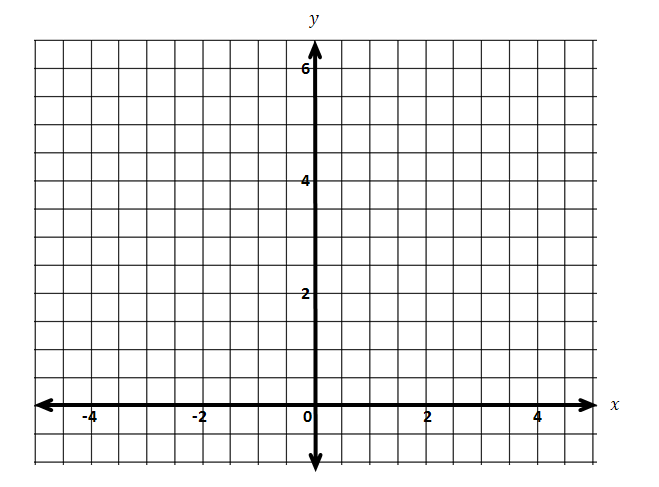
1. How does the graph of relate to the graph of **?**
2. How are the values of related to the values of **?**

Example 2

Let and , where can be any real number.

1. Rewrite the formula for in terms of (i.e., without using notation):
2. Complete the table of values for these functions.

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1. Graph both equations: and .
2. How does the graph of relate to the graph of ?
3. How are the values of related to the values of ?

Exercise 1

Complete the table of values for the given functions.

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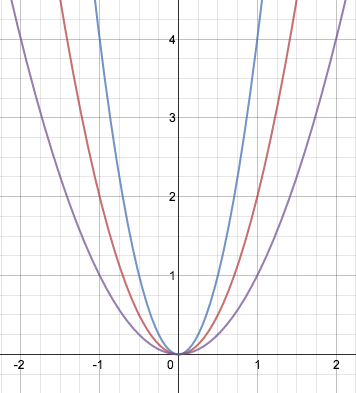
* 1. Label each of the graphs with the appropriate functions from the table.
  2. Describe the transformation that takes the graph of to the graph of .
  3. Consider . What does negating the input do to the graph of ?
  4. Write the formula of an exponential function whose graph would be a horizontal stretch relative to the graph of .

Example 3

* 1. Look at the graph of for the function in Example 1 again. Would we see a difference in the graph of if was used as the scale factor instead of ? If so, describe the difference. If not, explain why not.
  2. A reflection across the -axis takes the graph of for the function back to itself. Such a transformation is called a reflection symmetry. What is the equation for the graph of the reflection symmetry of the graph of ?

* 1. Deriving the answer to the following question is fairly sophisticated; do only if you have time: In Lessons 17 and 18, we used the function to examine the graphical effects of transformations of a function. Here in Lesson 19, we use the function to examine the graphical effects of transformations of a function. Based on the observations you made while graphing, why would using be a better option than using the function?

Problem Set



Let and , where can be any real number. The graphs above are of the functions and .

* 1. Label each graph with the appropriate equation.
  2. Describe the transformation that takes the graph of to the graph of . Use coordinates to illustrate an example of the correspondence.
  3. Describe the transformation that takes the graph of to the graph of . Use coordinates to illustrate an example of the correspondence.